

# Exhibit A

**DC-05472**

**Title:**  
**DUAL PORTED SAS BRIDGE FOR SINGLE PORTED SATA DEVICE**

**INVENTORS**

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**RELEVANT DATES & DISCLOSURES**

Submission Date: 5/12/2003  
Conception Date: 4/14/2003  
Invention first described in: email

**TECHNOLOGY**

**WITNESSES**

**Witness 1:** Jason Lau  
**Witness 2:** Kevin Marks

**THE PROBLEM**

In a SAS environment multiple paths to an end device, normally an HDD, are supported. SAS devices are defined as having two paths for failover, clustering, etc.

In a SATA environment, a Port Selector is a device that provides dual paths to a SATA device, usually an HDD. These type of devices will be used wherever clustering, failover or network storage requirements need to be met.

SAS supports SATA Tunneling Protocol (STP), which allows tunnelling down to a SATA end device. However, STP does not support dual paths to SATA end devices, nor does it support SATA Intermediate devices such as SATA Switches, Port Multipliers and Port Selectors. Interoperability between SAS and SATA is limited. The SATA Port Selector, which provides dual paths to a SATA end device, is not supported in the SAS domain. SAS supports dual paths only to SAS devices.

Figure 1 shows a simplified example of what is not currently supported in a SAS/SATA environment.

The invention proposes a SAS bridge device that supports dual SAS ports on the front end and a single file://C:/temp/ld\_pdf/DC-05472\_OC.htm (1 of 5) [5/12/2003 5:45:57 PM]

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SATA port on the back end. Such a device could be placed on an interposer PCB on a hard drive carrier, allowing the use of less expensive SATA drives in SAS environments that required dual paths to the drive.

## PRIOR SOLUTIONS/EXISTING TECHNOLOGY

Keywords for patent searches: SATA, SAS, bridge, dual port. Searched Dell patents, USPTO. No matches.

SAS and SATA specifications could be considered prior art. Each have separately defined a solution for supporting dual ports, but there is not an integrated solution that supports dual ports across both domains. The SATA committee has voted to proceed with Port Selector features to support discovery in a SAS environment. However, the SAS committee has asked for a more detailed presentation of the SATA issue. They may vote to work towards a common solution, however, there is no guarantee that this will pass.

## PROPOSED SOLUTIONS

The proposed device appears on the front end as dual ported SAS, and on the back end as single ported SATA. This combines two critical technologies in a new way: 1) bridging of SAS to SATA 2) Support for dual ported front ends by a single ported back end device. Previous efforts have attempted to make SAS and SATA compatible, however, there are limits to this compatibility. Note that the SAS to SATA bridge must account for dual ports. This is not the same as adding two single ported SAS to SATA bridges to a mux.

Figure 2 shows a diagram of the invention in a SAS environment. Figure 3 shows the detailed internal architecture of the device.

Strategically this protects Dell against the failure of the SAS and SATA committees to provide a solution. There are already levels of incompatibility between SATA devices such as SATA Switches, Port Multipliers and Port Selectors and the SAS STP. While it is commonly believed that SAS and SATA are compatible, SAS supports only SATA end devices, not intermediate devices such as SATA Switches, Port Multipliers and Port Selectors. Those devices are only supported in a pure SATA domain.

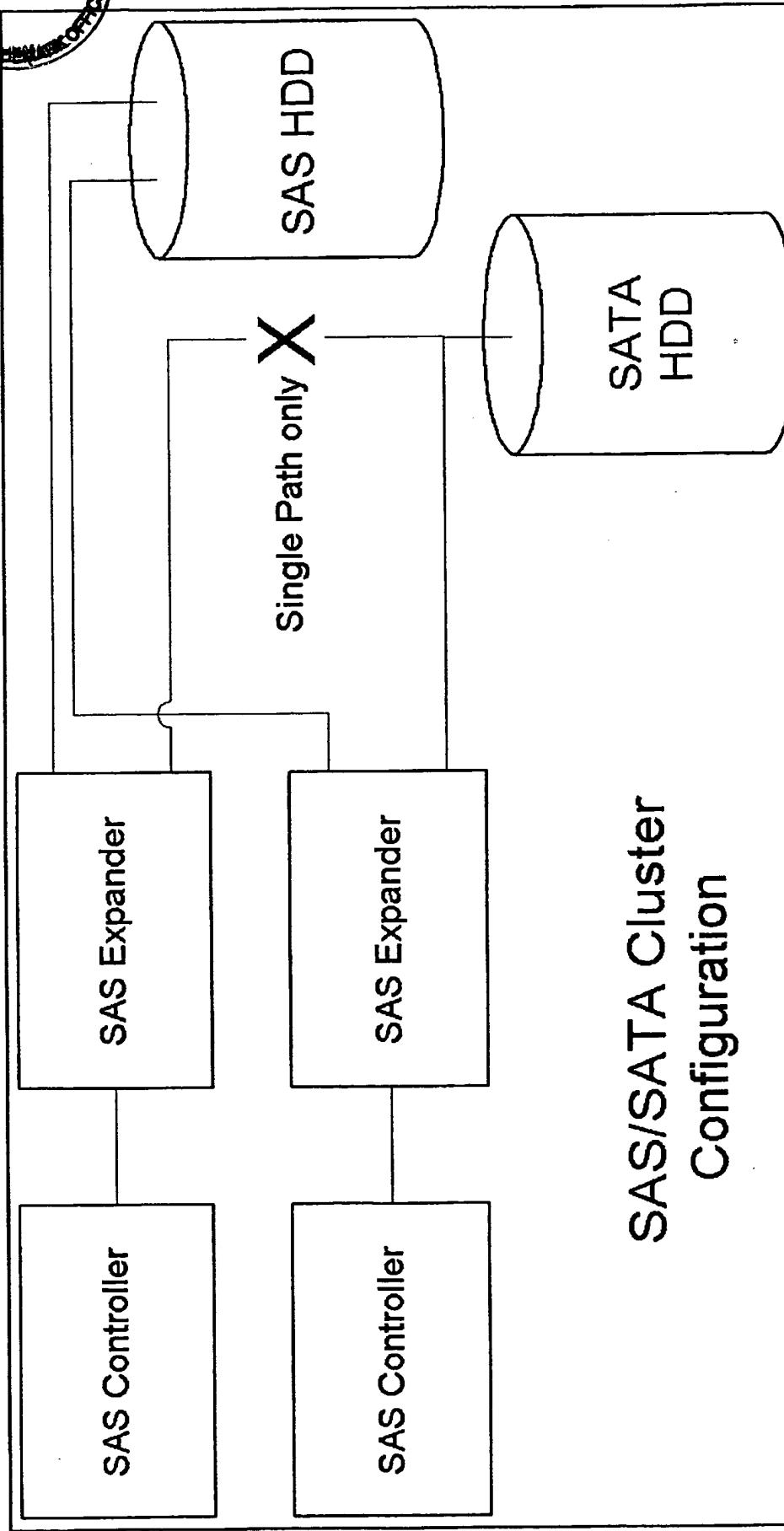
Application of this device in external storage would be high. Most external storage devices are used in clustering or networked storage where redundant failover paths are required. This device allows one common enclosure to house both SAS and SATA devices in a failover configuration with no single points of failure. Customers would not be expected to understand varying levels of SAS and SATA compatibility. This device will enable us to fulfill their expectations of full SATA support in external storage, providing a complete solution. Applications would include an iSCSI RAID JBOD that supported both SAS and SATA drives in the same box. Doing so without this device makes the SATA path a single point of failure.

Dell does not have any patents in the area of SAS to SATA conversion or dual SAS paths to a SATA drive.

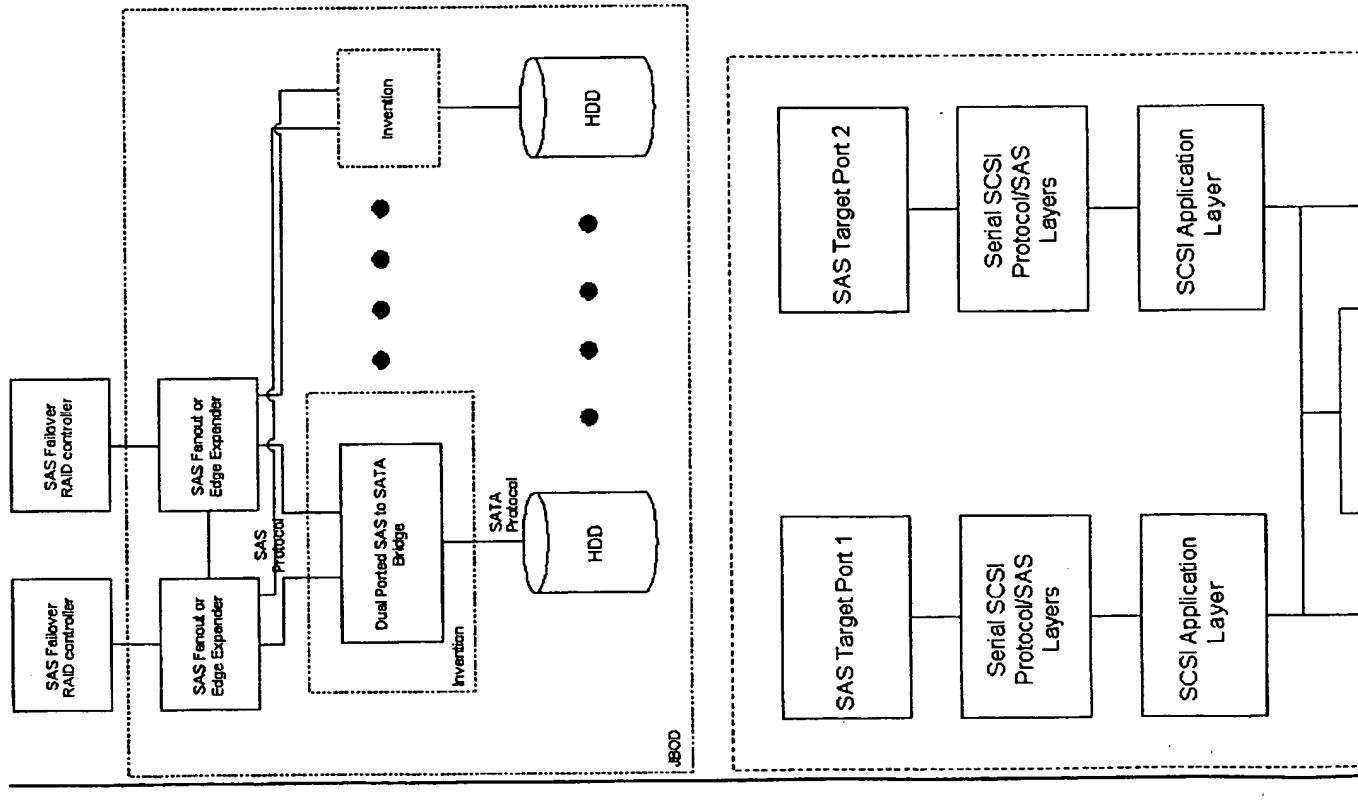
Prior art is discussed in the previous section.

Projected life of the technology could be as long as SAS and SATA coexist. This could be 10-20 years. This time period would be shortened by any successful effort by the SAS and SATA committees to fully integrate their systems. To date, integration and resolution of issues between SAS and SATA have been slow to develop.

## FIGURES



## SAS/SATA Cluster Configuration



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